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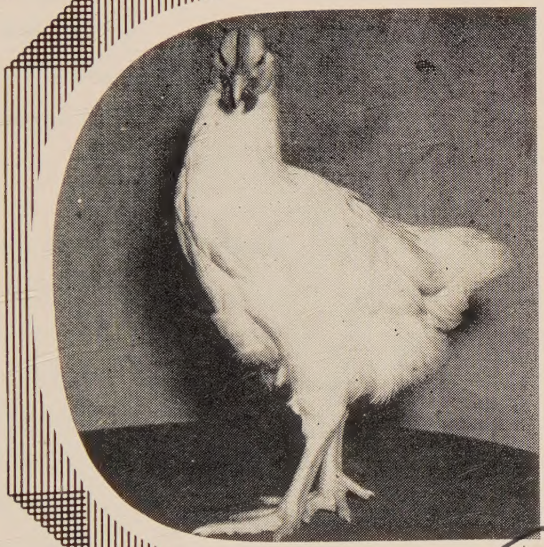
Broiler



PRODUCTION

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OKLAHOMA AGRICULTURAL EXPERIMENT STATION

Oklahoma A. & M. College, Stillwater

W. L. Blizzard, *Director* Louis E. Hawkins, *Vice Director*

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Broiler Production

STAFF*
Department of Poultry Husbandry

Almost half the chicks hatched in Oklahoma each year are fryers or broilers at the proper age and size. This includes most of the cockerel chicks, and some pullets—about 10 million broilers each year. There is also a year 'round demand for fresh, tender-meated young chickens to be served in eating places and homes. These two facts, put together, create considerable demand for information on ways of handling, feeding and marketing the State's potential broilers.

The Experiment Station during the past several years has done considerable research on methods of producing broilers under Oklahoma conditions, and especially on methods suitable for use on diversified farms. This publication presents recommendations based on results of that research, in combination with results of research at other Stations.

The Broiler Industry

The commercial broiler, produced in specialized broiler areas, has been accepted by housewife and restaurant patron alike as one of America's favorite foods. Broilers from northwestern Arkansas are hauled by truck loads into Oklahoma cities every day. Other truckloads travel across Oklahoma to Texas, New Mexico and Colorado.

Oklahoma's present broiler production cannot be called a broiler industry. The birds are produced in small units usually on farms, and they are sold in a wide variety of places rather than through specially organized broiler-marketing channels. *But farm broilers can be every bit as good as commercial broilers.* The lower price paid for farm broilers is due to the cost of assembling and handling the small lots, and to the difference in uniformity and quality between lots. Therefore the best market for small lots of broilers is to local buyers, locker plants and individuals, where each small lot is a unit of operation.

Specialized broiler areas which have developed in various parts of the United States are found in locations having a majority

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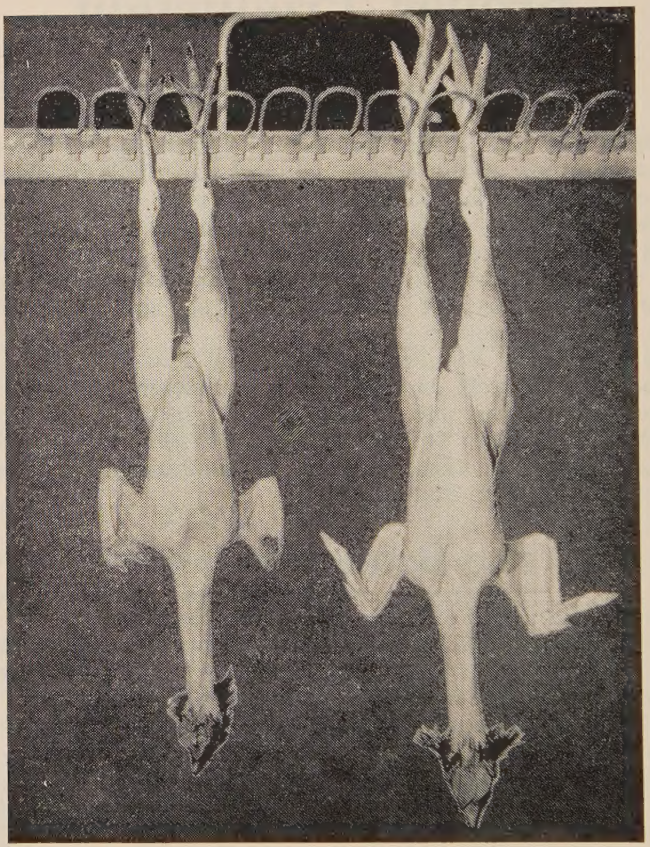


Top quality broilers are plump, well fleshed, well fatted and free from objectionable dressing defects.

of the following conditions:

1. Moderate climates.
2. Cheap or low building costs.
3. Conditions permitting chicks to use outdoor runs all winter.
4. Low labor and overhead costs.
5. Low-cost fuel for brooding.
6. A pervious soil or rolling terrain.
7. Relatively close proximity to markets.
8. Ready and easy credit to finance operations.
9. Serious need in the area for a new farm enterprise.
10. The activity of an individual with initiative and promotional ability.

Where these conditions exist it is reasonable to believe that a broiler area or district can be developed.

Selection of Broiler Stock

Ideal broiler chicks should be rapid growing, fast feathering, uniform, and well-fleshed. Plumage color is important, but differs according to market demands. Many live-bird markets prefer barred birds, while eviscerating plants pay premiums for white or nearly white chickens. It must be emphasized that the parent stock must be efficient producers; otherwise the cost of broiler chicks would be too high to allow a profitable enterprise.

Growth rate average is one measure used by all broiler growers as an important factor in success. Rapid growth rate requires early sexual maturity and large size of parent stock. Cockerels selected for broiler chick breeders should attain half of their adult weight when 12 weeks old, and pullets should reach three-fourths of their adult weight when 20 weeks old. On these standards a Barred Rock cockerel weighing less than 3½ pounds when 12 weeks old or a pullet weighing less than 5¼ pounds when 20 weeks old should not be in a breeding flock to produce broiler chicks.

CHOOSING BREEDING STOCK

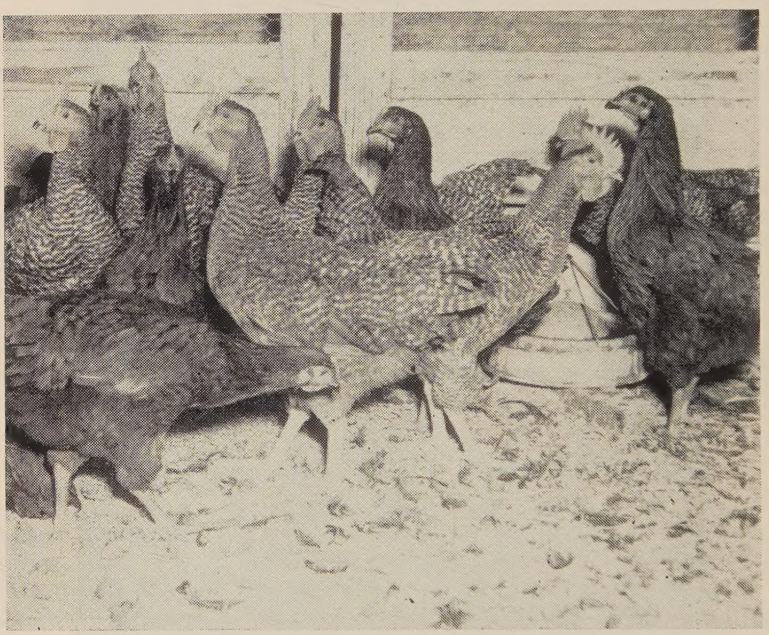
Satisfactory broiler stock, regardless of breed, must produce birds that are uniform in size, fattening ability, body shape, growth rate, and early feathering. It is not possible to secure or maintain uniformity in these characteristics without careful, intelligent and persistent selection for them in a sound breeding program.

Stock for profitable broiler production must have these minimum requirements: Weigh 3 to 3½ pounds at 12 weeks of age; require only about 4 pounds of feed per pound of gain; be fully feathered and well-fleshed at marketing time; and come from parents with good reproductive efficiency. A proposed goal is a 3-pound broiler at 9 weeks, produced on 9 pounds of feed, and with a maximum of 5 per cent mortality.

High standards are needed in a breeding flock to produce good broiler chicks. The flock must meet 13 major requirements. The first five relate to the kind of chicks produced. The chicks must have:

1. Low mortality in the brooder house.
2. Rapid feathering, as shown by long wing feathers and tail feathers when 10 to 14 days old.
3. Rapid growth, to produce prime broilers when seven to nine weeks old.
4. Good fleshing at all ages.
5. Uniformity in color, size and body conformation.

For broilers themselves the requirements could stop here, but the relationship between production flocks and broiler production requires eight more points relating to the pullets and



Rapid feathering, rapid growing, uniform, well fleshed, vigorous broiler stock is essential in any profitable broiler enterprise. These characteristics were used as a guide in selecting the broiler stock from which these broilers came.

cockerels chosen to be parents of the broiler chicks. The breeder pullets and cockerels must show the following characteristics:

6. Low mortality on the range.
7. Early maturity.
8. High rate of egg production.
9. Non-broodiness.
10. Persistent egg production.
11. Large egg size, attained rapidly when the pullets begin to lay.
12. High fertility in the laying flock.
13. Low percentage of culling to maintain economic production.

BREEDS AND STRAINS FOR BROILER PRODUCTION

Few strains are perfect for all requirements. Some are remarkably superior in many of them. These are the strains which produce chicks that pay broiler dividends.

Most of the more common breeds of chicken, and many of the less common ones, have been tried by someone in "the broiler business." Waves of popularity have hit Barred Rocks, White Rocks, White Wyandottes, New Hampshires, and Rhode Island Reds. In recent years a number of new breeds and strains, or developments of old breeds, have been especially developed for broiler production. The mass of broiler production has settled to a relatively few breeds and cross breeds, and in these *the particular strain used is of more importance than the breed.*

It is difficult to recommend one breed or cross for broiler production, because each grower has his own particular situation. Also, the popularity of the different breeds and crosses varies according to localities. However, no matter what breed is picked for broiler production, be sure that the most efficient strain is selected. *There are as many differences between strains as there are between breeds.*

In selecting crossbred chicks it must be remembered that some crosses "nick" or combine well together while others do not. *Pick a cross that "nicks" well.*

Barred Rocks

The Barred Rock is not tops in popularity with broiler growers because many strains are slow growing, slow feathering, and small in size. Many broiler buyers hesitate to buy Barred Rock broilers because of past experience with slow feathering and therefore black pin feathers. Only a very small proportion of the commercial broilers produced today are Barred Rocks. However, some strains of Barred Rocks are suitable for broiler production, especially if a market demands barred birds. In the commercial broiler areas a barred cross is generally used, because the crosses seem to be more efficient than the Barred Rocks. Poultry processors dislike the dark pin feathers left on the birds.

The Oklahoma Agricultural Experiment Station has developed a Barred Rock strain that is rapid growing, rapid feathering, and large in size. Other strains of Barred Rocks that possess these characteristics are found in Eastern broiler areas.

White Rocks

White Rocks have made considerable progress in recent years in growth, uniformity, and the elimination of the green shank

defect, and so have become more popular as broilers. They dress out well and therefore have found favor with processors. If a grower decides on White Rocks, he must make sure to get a fast-growing, fast-feathering, uniform strain.

White Wyandottes

White Wyandottes, although favored by their white plumage, have not been greatly used for commercial broiler production. Most strains have been poor in reproductive proficiency, growth, and feathering. However, some strains available today are efficient converters of feed into meat.

New Hampshires

New Hampshires are extremely popular as broilers. As a general rule they grow fast, feather well, and are uniform. Their light red plumage color is not objectionable to the processors, and they have good meat quality.

Rhode Island Reds

Most strains of Rhode Island Reds have been developed mainly for egg production. However, many egg production strains grow fast enough to make good broilers. They do not dress out as clean as New Hampshires, and rapid feathering is not a universal characteristic with them.

Cornish

Most varieties and strains of Cornish have a desirable body conformation but are seriously deficient in reproductive performance, growth, feathering, and uniformity. They are also tight-feathered birds, which does not make for ease in picking. These weaknesses far overshadow their one good point. So, as a general rule, Cornish are not used very much in broiler crosses or by themselves for commercial broiler production. Some breeders have greatly improved some strains of Dark Cornish and White Cornish so they produce efficient crosses, but only a few very good strains are suitable for commercial broiler production crosses.

Delawares

The Delaware is a new breed, developed in the state of Delaware especially for the production of crossbred broiler chicks. It has a Columbian plumage pattern, and apparently has good broiler qualities. Generally a Delaware male is crossed on New Hampshires females, the resulting offspring being Columbian patterned.

Oklahoma Dominant Whites

Oklahoma Dominant Whites, developed by the Oklahoma Agricultural Experiment Station, are used for crossing with any colored breed to produce broilers with predominantly white plumage. Oklahoma Dominant White males are usually crossed with New Hampshire females, although other breeds of females may be used.

Some birds of this same type are being produced in the northwest under the name of "Large Whites." The males of this type are generally crossed with New Hampshire females for broiler chick production.

Barred Broiler Cross

A barred broiler cross is produced by mating a specific strain of Barred Plymouth Rock males to a specific strain of New Hampshire females. The chicks from this cross have indistinct barred plumage with some silver and brownish tinges. This is the most popular cross produced today in the eastern commercial broiler areas.

Leghorn X Red Crosses

Crosses of Leghorns and Rhode Island Reds are generally intended for egg production. They are sometimes used to produce small broilers, but generally speaking they are not as efficient as the heavy breed crosses.

Incross Hybrids

In incross hybrids, most emphasis to date has been on egg production, and none have been produced that are suitable for broiler production.

Production Systems

The two systems of production practiced in commercial broiler growing are battery production and floor brooding. None of the extensive broiler-producing areas grow broilers in batteries. All large-scale commercial broiler production uses the floor-brooding system.

FLOOR BROODING

In floor brooding for broilers, the chicks are brooded in lots of from 250 to 3000 or more, depending on the type of brooding

equipment and policies of the operator. Individual brooder stoves are used, burning gas, wood, electricity, or fuel oil.

When the chicks are divided into small units the brooder house is partitioned into rooms of various sizes. Floor space allowed for each chick ranges from 3/5 to 4/5 of a square foot. Two brooders and 500 chicks in a 20 x 20 foot room is a popular arrangement.

When chicks are brooded in large units, all partitions are eliminated and heat is provided either by a row of brooder stoves evenly spaced the length of the house, or by radiant heat. The radiant heat equipment consists of coils of pipe embedded in the concrete floor, with hot water circulating through the pipes.

For floor brooding production of broilers on a commercial scale, a full-time one-man or family-operated unit would have 10,000 capacity. This means all the chicks are started on the same day and are ready to market on the same day. Units of 1,000 or 5,000 can be considered as only part-time enterprises. In full time units of 10,000 size the disease hazard is lessened, marketing possibilities are enlarged, and labor requirements are lowered.

For 10,000 broilers, floor space of 6,000 to 8,000 square feet is required for brooding. This is equivalent to three or four houses 20 x 100 feet in size, or two or three houses 30 x 90 feet. This floor space is minimum and is usually used in connection with yards where the chicks can run as soon as they are large enough to need the additional space. The space per chick can be somewhat less as the total floor space without partitions is increased. It is likely that chicks will do as well on 3/5 of a square foot per chick in a 30 x 90 foot house without partitions as in a 20 x 20 foot house having 4/5 of a square foot per chick.

Four to six inches of absorbent type litter is used on the floor. This may be ground corn cobs, sawdust, sugar cane pulp, peat moss, or peanut hulls. These are the best, although some of them add materially to the cost of growing the broilers. Other litter materials may be available in some localities. Whatever is used, it must be absorbent, easy to get, inexpensive, be in small particles but free of dust, and easy to stir. The same litter has been successfully used for more than one crop of broilers where there has been no evidence of disease. This practice is not recommended, but is suggested only to experienced growers. In the floor brooding method of broiler production it is possible to grow three or four lots in the same equipment in a year. This leaves some time between lots to renovate and dry the litter or to clean the house and put in litter.

BATTERY BROODING

Battery broilers are popular with exacting customers who will pay a premium for them. These choice frying chickens are produced in limited quantities by small volume operators in or near many centers of population. Where it is desired to produce 100 to 500 broilers per week the operator is tempted to use the battery method. However, it is difficult to make these small battery projects profitable.

Disadvantages—There are six distinct disadvantages in battery broiler production:

1. Respiratory diseases can be disastrous.
2. Breast blisters prevail and cut into income and profits.
3. The disposal of manure is a problem and often an expense.
4. Battery broilers must be slaughtered immediately upon removal from the battery; they will not stand live shipment or handling.
5. The investment per broiler is high.
6. The labor required is greater per broiler unit.

Advantages—There are also six advantages in battery broiler production:

1. The birds make more rapid growth up to 12 weeks.
2. They are softer meated birds, of high quality.
3. The feed cost of production is slightly lower.
4. The menace of coccidiosis is lessened.
5. Three broilers can be produced on the same floor space used for one broiler in floor brooding.
6. It is assembly line production.

Space Requirements—The space requirements for battery broilers are:

Day-old to 3 weeks—18 square inches per chick and 200 cubic inches per chick, which is about 3 x 6 x 11 inches.

3 to 6 weeks—30 square inches per chick and 420 cubic inches per chick, which is about 3 x 10 x 14 inches.

6 to 12 weeks—60 square inches per chick and 1020 cubic inches per chick, which is about 6 x 10 x 17 inches.

The ceiling in a battery brooder room should be not lower than 10 feet.

A 10,000 broiler capacity in batteries, which is some fewer than 1,000 broilers per week, requires 45 starting battery sections, 90 intermediate sections, and 180 finishing sections, each section approximately 30 x 40 inches floor space. A building with a 10-foot ceiling and 3,600 square feet of floor space is needed for these batteries. This is a building with 40 x 90 feet exclusively for the batteries. There must be service, killing, and other room in addition to this space.

Management of the Broiler Enterprise

For a broiler enterprise to be successful, it should repay in cash receipts and other credits all cash expenses made for the broiler brood, plus the overhead cost of building and equipment used by the brood, and a return for the labor and management of the operator.

The average cost of producing a broiler chick to market age will range between 65 cents to 85 cents when broiler mash is 5 cents per pound and chicks are 15 cents each. These costs include approximately 66 per cent for feed, 20 per cent for chicks, 8 per cent for labor, 2 per cent for fuel, 2 per cent for building and equipment cost, 1 per cent for litter, 1 per cent for medicine or sanitation products, and 2 per cent for miscellaneous cost. As shown in this breakdown, the large items of cost are feed, chicks, and labor. They are also the costs which may vary most from year to year. Feed, the largest single item of cost, may vary from 60 per cent to 70 per cent of the total.

There are many factors which may affect the cost and returns in broiler production. One of the major factors is the size of the enterprise. The larger the number of broilers started in each brood, the more profit will be made per bird. The larger the broiler enterprise, the greater the efficiency of labor and management that can be had.

There are two possible ways of increasing the size of the broiler enterprise. One is to raise more than one brood of broilers per year; the other is to increase the facilities for handling broilers. Raising more than one brood a year results in more complete use of available labor, building, and equipment, thereby spreading the cost out over a number of broods. However, increasing the number of lots started without increasing size of each lot does not result in more efficient labor returns, as would result from increasing the size of each lot.

Another factor affecting costs and returns is whether the broiler enterprise is the farm's main source of income or a supplementary source.

Since feed is the largest item of cost in the broiler enterprise, an increase in feed efficiency would bring about a decrease in cost. Better feed efficiency can be obtained by buying good quality chicks, reducing the wastage of feed, improving feeding practices, and reducing mortality.

Mortality and diseases have a definite effect on cost and returns. An increase of one per cent in mortality increases cost of production for each chick 0.2 of a per cent. Diseases within a brood will retard growth, require more feed to produce a pound

of gain, and will delay the birds in reaching market age.

Prices paid for chicks in most cases reflect the quality of the chicks. Quality chicks should live well, have a good rate of gain, and consume less feed per pound of gain, which would tend to offset the somewhat higher cost of the chicks.

Feeding Methods

The objectives of broiler feeding are three-fold:

First, to maintain the maximum possible growth rate during the entire growing period.

Second, to produce this rapid gain at a low output of feed per pound of gain.

Third, to reach a marketable weight in the shortest possible time.

In order to realize these objectives, specific requirements of ration composition and feeding practices must be met.

RATIONS

The All-Mash Plan

The feeding of an all-mash broiler ration during the entire growing period is probably the most generally practiced feeding method. The all-mash method greatly simplifies management procedures and gives excellent results.

The Mash

The broiler mash must contain *all* of the essential nutrients in adequate quantities to meet the requirements for best growth. This is essential. Broilers do not have access to supplemental feeds such as pasture which under more normal growing conditions furnish vitamins, protein and minerals. Under the intensive growing conditions of broiler production, marginal deficiencies in the feed show up quickly and are very severe. These deficiencies slow down growth, reduce market quality, and leave the birds in a weakened condition in which they are more susceptible to coccidiosis and other diseases.

Formulas of broiler mashes found satisfactory at this and other Experiment Stations are given on pages 21 and 22.

Water

An adequate supply of clean water must be provided at all times. Water is the cheapest feed a broiler consumes. A lack of

The objectives of broiler feeding are to reach marketable weight in the shortest possible time at a low output of feed per pound of broiler produced. The pullet above weighed 3 42 pounds and the cockerel shown on the next page weighed 4.76 pounds when 12 weeks of age. The average weight per broiler at that age, including both males and females, was 4 09 pounds. An average of 3.12 pounds of feed was consumed for each pound of gain Each broiler ate 12 51 pounds of feed during the 12-week growing period

A 12-week-old cockerel that weighs 4.76 pounds.

water for even a short period of time slows down growth. Fountain warmers must be provided in cold weather to prevent the water from freezing.

Green Feed, Tonics, Not Recommended

Green feed is of no value to broilers if an adequate, well balanced broiler mash is fed. Since a maximum consumption of mash is desirable, green feed is not used in broiler production.

The use of tonics of any kind is not recommended. Time, money, and effort are best spent in preventing disease outbreaks and properly diagnosing and treating diseases if outbreaks do occur.

Control of "Pasting Up"

With growers where "pasting up" has been a problem, the feeding of chick sized grain as the only feed for the first two days after the chicks are received is recommended as a preventive measure. This does not entirely eliminate the trouble, but seems to reduce the number of chicks which paste up. The feeding of grain is discontinued and regular broiler mash fed in its place beginning on the evening of the second day.

Use of Pellets and Wet Mash

Pellets—Pellets are fed primarily as a supplementary feed during the last six to eight weeks of the growing period. The feeding of the regular broiler mash in pellet form during the entire growing period is not recommended.

Pellets help to keep feed consumption at a maximum and stimulate an increased intake when a slump in feed consumption occurs. But the feeding of pellets in no way permanently increases feed consumption above the intake which would normally occur with regular unpelleted mash.

Pellets are usually fed twice daily sprinkled on top of the mash in the hoppers, but may be kept before the broilers at all times in a separate hopper.

Wet Mash—Wet mash is fed primarily to increase feed consumption and improve finish. It is fed only for a week or ten days just prior to marketing. If it is fed for a longer period, the broilers may go off feed and be in a poorer condition than if kept on a dry mash or dry mash and grain ration.

Few growers now use a wet mash since the increased returns do not seem to justify the additional labor. Furthermore, shrinkage is high when the broilers are transported from the farm to the packing plant; and packing houses therefore discourage wet mash feeding.

Wet mash is prepared by moistening a portion of the regular mash with water or diluted condensed buttermilk to make a crumbly mixture. It is fed on top of the dry mash twice daily, giving the birds only what will be cleaned up in 20 minutes. Cracked corn may be soaked in condensed buttermilk overnight and fed in the same way.

Possible Modifications of All-Mash Plan

There are several possible modifications of the all-mash plan. *These modifications are not recommended except in exceptional situations.* They are included here because they answer questions and point out practices of many inexperienced growers. *The straight all-mash method of feeding broilers is the standard recommended practice.*

Whole Oats

Whole oats are of some help in stimulating feather growth and bone development, and in reducing cannibalism. Feeding of whole oats can start when the broilers are two weeks old. The oats are kept before the birds in a hopper, or may be fed as a scratch in the litter. Feeding of oats is discontinued at six weeks and whole or cracked corn gradually substituted.

Corn

Protein requirements are sufficiently decreased by the sixth week to permit the feeding of whole or cracked corn in addition to the mash. This not only helps to cut costs by reducing the intake of high-cost broiler mash, but also makes it possible to utilize home-grown grains efficiently.

Feeding tests show that corn added to the ration when the broilers are six weeks old reduces the amount of wet litter that must be removed during the remainder of the growing period. A reduction in water intake brought about by the coarser textured diet is responsible for this condition. Water in excess of normal intake is not needed to wash down the coarser feed, as is the case with the finely ground mash. The amount of corn is gradually increased until the broilers are eating approximately one-third corn by the tenth week.

Grit

Grit is not essential for broilers, but is desirable when whole grains are included in the ration. Tests show that an insoluble, noncalcareous grit makes it possible for the broilers to get more benefit from grain.

Calcareous (limestone) grit is not used because adequate calcium is provided in the broiler mash itself. The addition of extra calcium in the form of calcareous grit may result in the overfeeding of calcium. Furthermore, calcareous grit is not as efficient as the harder grit.

Grit is fed in a separate hopper.

FEEDERS

Size and Arrangement

Adequate feeder space is required if maximum growth is to be maintained. Feeder space is adequate if one-third of the broilers can eat at one time. The following figures give some idea as to actual feeder space requirements.

1 to 4 weeks of age—six feet per 100 chicks, or 0.7 of an inch per chick.

4 to 10 weeks of age—twelve to fourteen feet per 100 chicks, or 1.4 to 1.7 inches per chick.

10 to 20 weeks of age—sixteen to twenty feet per 100 chicks, or 1.9 to 2.4 inches per chick.

When the broilers are three weeks old, the small, chick-size feeders should be replaced by larger intermediate feeders. Feeders with a reel are preferable to those with a grill or holes through which the chicks reach the feed.

Feeder space is used most efficiently when the feeders are set at right angles to the house windows. Broilers prefer to eat facing the light and make use of only one side of the feeder if it is parallel to the source of light.

The feeders should be moved frequently to distribute the droppings over the floor and prevent pits and slick spots from forming in the litter.

Filling Feeders

At the first feeding the feeders are filled heaping full. This helps the chicks learn where the feed is located. At no other time are the feeders filled more than two-thirds full.

Allow the feeders to become empty before they are refilled. This practice serves several purposes. Litter and dirt can be quickly and easily removed from the feeders. Stale feed does not accumulate in the bottom of the feeders. The broilers are stimulated to eat more feed. Care must be taken, however, to see that the broilers do not go without feed for several hours before the feeders are refilled.

BROILER MASH FORMULAS

Broiler mashes containing a minimum amount of crude fiber and a maximum amount of readily digestible, energy-producing nutrients have recently been developed. A great deal of attention has been given these broiler mashes by feed manufacturers and broiler growers in Oklahoma. These so-called low-fiber, high-energy broiler mashes produce extremely rapid growth at a low output of feed per pound of gain.

This type of broiler mash contains from 2 to 4 per cent of crude fiber. The crude fiber has been replaced with easily digested, energy producing ingredients. In this way the utilizable energy in the ration is raised well above normal. A protein level of 21 per cent or slightly higher is provided by a carefully selected combination of high quality animal and vegetable protein concentrates. Vitamin supplements are added to provide high levels of certain B complex vitamins and as yet unidentified essential growth factors, one of which now seems to be B12. The added vitamins and the high energy level in the mash make possible a more efficient utilization of the protein present. This results in an accelerated rate of growth.

There are several disadvantages to the practical use of these rations in broiler production. Many of the ingredients are difficult to obtain. Others may readily be obtained, but the cost is relatively high. In addition, feeding tests indicate that cannibalism, leg weakness and poor feathering may become a problem, especially when the mash contains a high level of corn. These disadvantages may be offset by the rapid, economical gains made by the broilers.

The feeding of a broiler mash of this type is to be recommended when ingredients can be obtained at a reasonable cost. Best results are obtained when these mashes are not supplemented with whole grains during any stage of growth.

Three low-fiber, high-energy broiler mash formulas developed at the Oklahoma Station and tested under Oklahoma conditions are listed in Table I.

The formula for the Connecticut Broiler Ration, which has received a great deal of publicity in recent years, is listed in Table II. This formula was developed at the Storrs Agricultural Experiment Station. Supplementary feeding of hard grains with this mash formula is not recommended during any stage of growth.

The Delaware Broiler Ration given in Table III was developed at the University of Delaware. The ingredients used are more readily available than are those required for the Connecticut Broiler Ration. The Delaware ration may be fed as the complete broiler ration from the first day until the broilers are sold. Or, if desired, limited amounts of cracked corn may be added during the last two weeks.

TABLE I—Oklahoma Broiler Rations

(Pounds, except as noted)

	Okla. BR1	Okla. BR2	Okla. BR3
Ground yellow corn	56	52	58
Pulverized oats	5	5	5
Corn gluten meal	10	10	10
Distillers dried solubles		7	
Fish meal	5	3	3
Meat and bone scrap			5
Soybean meal	19	18	16
Delsterol	.05	.05	.05
Vitamin A supplement to supply 2000 International Units of Vitamin A per pound of ration.			
Riboflavin to supply 1000 micrograms per pound of ration.			
Choline chloride (gm)	32	32	32
Niacin (oz.)	1	1	1
Manganese sulfate (oz.)	0.2	0.2	0.2
Salt	1	1	1
Calcium carbonate	1	1	1
Steamed bone meal	2	2	

TABLE II—Connecticut Broiler Ration

(Pounds, except as noted)

Yellow corn meal	69.35
Fish meal (60% protein)	8.00
Meat and bone scrap (50% protein)	8.00
Soybean oil meal (42% protein)	8.00
Unextracted liver meal	3.00
Butyl fermentation product	2.00
Alfalfa leaf meal	1.00
Salt	.50
Vitamin D equivalent to 400D/gram	.15
Manganese sulfate	.025
Nicotinic acid (mg.)	900
Choline chloride (gm.)	32
	100.0

TABLE III—Delaware Broiler Ration

(Pounds)

Ground yellow corn	43.4
Ground wheat	18.7
Ground oats	5.0
Meat and bone scrap (50% protein)	6.8
Fish meal	3.7
Soybean oil meal	12.0
Corn gluten meal	5.0
Alfalfa leaf meal	2.0
Dried whey	1.0
Riboflavin concentrate	1.3
Ground limestone	.8
Iodized salt	.4
Delsterol	.05
Manganese sulphate	.013
	100.28

GROWTH RATES AND FEED CONSUMPTION

Table IV shows results of a recent Oklahoma Station test on growth rate and feed consumption using various rations. The birds were crosses of Rhode Island Reds on Barred Rock. Rations used were two of the Oklahoma A. and M. rations, the Connecticut broiler ration, and the Delaware broiler rations listed in this bulletin. Two commercial broiler rations of Oklahoma manufacture were also used. The rates and feed consumption figures in this table gives some idea of what can be done with these rations and with good broiler stock.

TABLE IV.—Summary of Feeding Tests with High-Energy, Low-Fiber Broiler Rations

Average Weights and Feed Consumption at Ages Shown	Okla. BR1	Okla. BR3	Conn.	Delaware	Comm. No. 1	Comm. No. 2
8 Weeks						
Weights						
Males	2.42	2.57	2.30	2.33	2.39	2.23
Females	1.99	1.99	1.96	1.70	1.87	1.90
Both	2.20	2.28	2.13	2.02	2.13	2.07
Feed Consumption (Lbs.)						
Per Broiler	5.47	5.95	4.87	5.62	5.14	4.83
Per Pound of Gain	2.58	2.70	2.38	2.91	2.51	2.43
10 Weeks						
Weights						
Males	3.57	3.71	3.30	3.43	3.51	3.26
Females	2.80	2.79	2.66	2.46	2.62	2.66
Both	3.19	3.25	2.98	2.95	3.07	2.96
Feed Consumption (Lbs.)						
Per Broiler	8.36	8.84	7.56	8.72	7.74	7.13
Per Pound of Gain	2.69	2.79	2.61	3.04	2.59	2.48
11 Weeks						
Weights						
Males	3.99	4.14	3.69	3.78	4.00	3.59
Both	3.55	3.62	3.32	3.22	3.46	3.24
Feed Consumption (Lbs.)						
Per Broiler	10.03	10.54	9.12	10.60	9.21	8.76
Per Pound of Gain	2.89	2.97	2.82	3.38	2.72	2.77
12 Weeks						
Weights						
Males	4.59	4.76	4.27	4.31	4.60	4.14
Females	3.38	3.42	3.26	3.01	3.30	3.27
Both	3.99	4.09	3.77	3.66	3.95	3.71
Feed Consumption (Lbs.)						
Per Broiler	12.03	12.51	10.99	12.66	11.08	10.76
Per Pound of Gain	3.08	3.12	2.98	3.54	2.86	2.96

Processing and Marketing Broilers

Feed, but not the water, should be removed from in front of the birds 3 to 4 hours before killing. When the crop and intestines are empty of feed at the time of killing, bleeding and dressing will be easier.

KILLING

There are three methods of killing broilers. Many small processors kill by simply chopping the head off and throwing the chicken into a barrel to bleed. No more birds should be killed at one time than can be scalded and picked before the feathers begin to set. In this method of killing, the scalding water becomes contaminated rapidly due to the presence of blood on the feathers. Scalding water should be changed when it becomes contaminated to prevent bacterial infection which would lower the keeping quality. This is not a recommended method.

A second method of killing is to cut the bird's throat, while a third method is to cut the jugular vein through the mouth and then pierce the third lobe of the brain. The third method of killing requires considerable practice and skill but is the most satisfactory.

When either the second or third method is used, the birds must be hung by the feet or slipped inside a funnel with the head hanging out in order to insure proper bleeding.

If the birds are hung by the feet for killing, a weighted blood cup or a canvas canopy should be used to prevent the chicken from throwing blood over the dressing room.

SCALDING

"Hard scalding" is the practice of using 150 to 190 degree water for scalding. The time of immersion varies with the temperature of the water but should be only long enough to loosen the feathers. This type of scalding makes the removal of feathers very easy; but it has the disadvantage of cooking the fat out of the skin, which leaves a hard, discolored and shiny surface when the bird cools and is dry.

Broilers being dressed for commercial locker storage or any other purpose than immediate use should be semi-scalded (125° to 127° for 30 seconds, with constant agitation). Extra care should be exercised to prevent the temperature of the water from fluctuating greatly. Water cooler than 125° will make the picking

Grading of broilers before they are offered for sale is of utmost importance. Consumers want a top quality broiler. When consumers obtain top quality broilers, they remain good broiler customers.

hard, while water above 127° will burn the skin. When the skin is burned during scalding, unsightly dark brown blotches will appear on the carcass as it cools and dries.

PICKING

If more than a few broilers are to be dressed, it is absolutely necessary to use a mechanical picker. Such pickers may be obtained to fit almost any need and will soon pay for themselves in time saved. When mechanical pickers are used it is very important that the birds be semi-scalded. If the scalding water is too hot the mechanical pickers will tear the skin.

CHILLING

All body heat must be removed from the carcass as soon as possible after picking, in order to reduce the danger of visceral taint and improve the keeping quality.

Satisfactory cooling may be obtained by the use of cold water (35° to 40°) or crushed ice. The most satisfactory results, however, will be obtained by the use of an ice slush. If the slush can be kept agitated, the cooling will be even more rapid.

Birds should not be left in a cold water or ice slush bath for more than about three to four hours. Excessive time in such cooling devices tends to increase the bacterial contamination of the carcass, thus reducing its keeping quality. Under no conditions should such cooling solutions be used a second time.

Unless cold air is kept in constant circulation, it is not a satisfactory means of removing body heat.

FREEZING FOR LOCKER STORAGE

In preparing broilers for storage in lockers, birds should be cut into serving pieces before being wrapped and frozen. Small size broilers may be placed in a quart container. If the storage period is to be for very long the container may be filled with water before it is frozen.

Broilers which are too large to be placed in a quart container may be wrapped in any acceptable air tight wrapping such as cellophane or aluminum foil. When using such a wrapper, care should be taken to exclude as much air as possible from the package. Large amounts of air within a package result in excessive drying of the meat during storage.

MARKETING

A small producer will find a ready market for all of the good quality broilers he can grow. The most profitable method of selling for such producers will be to develop a special trade for

Picking broilers by hand is a simple operation when done properly. After the broiler is thoroughly bled and the large wing and tail feathers removed, it is immersed in water at a temperature of between 125 and 127 degrees F. and agitated for 30 seconds. It is then hung up on a shackle and the feathers on the breast, thighs, and base of the wings picked first. The back, wings, tail, and neck are picked last, in that order. When the broilers are machine picked they should be hand finished.

dressed birds. If birds are to be sold alive, large numbers of broilers must be produced and sold at one time in order to show a reasonable profit on the time and money invested.

Disease Control

GENERAL PRECAUTIONS

Broiler growers must remember:

1. The occurrence of Pullorum in a broiler house is disaster. Guard against it by purchasing only chicks from sources known to use eggs from flocks free of Pullorum or Pullorum clean.

2. Shipping crates or coops, used feed sacks or chick boxes, visitors, salesmen, etc., can bring parasites or disease to a clean flock of broilers.

3. On the broiler plant, parasites and disease can be carried from house to house, on feed pails, scoops, catching coops, and shoes and clothing of workers.

4. Careless disposal of dead birds, manure and litter, along with the use of ditry feeders or contaminated water, and presence of rats or wild birds, can cause a disease outbreak.

INFECTIOUS BRONCHITIS

Infectious bronchitis is a virus disease which affects chicks in the first 10 days, with occasional outbreaks in older birds. Gasping, a rattling in the throat, and coughing are characteristics of this disease. The bronchial tubes are inflamed. Take out infected birds at once. Clean the house and disinfect or fumigate with formalin and potassium permanganate.

NEWCASTLE DISEASE

Newcastle disease is indicated in young stock by a respiratory condition resembling bronchitis, with sneezing, coughing, and a slight nasal discharge. A small percentage of the chicks will show paralysis and a larger percentage will show twisted necks, shaking, and other nervous symptoms. Mortality may be light but frequently is very heavy. Newcastle is a virus disease and satisfactory treatment or remedy for chicks is not known. Where this disease is known to have been in previous broods, it is suggested that chicks be vaccinated with a killed virus vaccine as they are put in the house. If an outbreak occurs the best treatment is to keep the chicks quiet as possible, comfortable, and drinking and eating.

Broiler chicks known to have been produced from flocks that have been vaccinated with live virus vaccine, or that have passed through an outbreak of the disease, should be vaccinated when 4 weeks old. Killed virus vaccine or live virus vaccine are used for this purpose. Each type of vaccine has its adherents and advantages which the other does not possess.

PULLORUM

Pullorum disease is carried by adult chickens. It is transmitted by infected hens to the chicks hatched from their eggs, and in turn to other chicks. The cure, prevention and treatment lies wholly in accurate and persistent testing of hens used to produce hatching eggs and removal and disposal of infected hens (called reactors) from the flock. Death loss of chicks from infected eggs

will begin when they are about four days old and will last for several days. About the time death loss among these chicks is over, chicks infected after hatching by being in contact with the congenitally infected chicks will begin to die; and this can continue till the entire brood is lost. Symptoms are droopy chicks, yellowish droppings, pasting up behind, and a peculiar twittering chirp. There is no treatment for chicks except to take out droopy ones and hope the others are not infected. As always, have the chicks warm, comfortable, undisturbed, and drinking and eating. The remedy is to purchase chicks from sources free of Pullorum or Pullorum clean.

COCCIDIOSIS

Coccidiosis in its acute form is another disease that can cause disaster in a broiler flock. Coccidiosis is caused by a parasitic organism which destroys the inner membranes of the caeca and intestines. Chicks can have Coccidiosis only by taking the organism into the body through the mouth. The organism can be taken into the brooder house on the shoes or clothing of attendants, and on scoops, feed sacks, coops, and the like.

Infected chicks show rough feathers, pale beak and shanks, and are listless and droopy. Bloody droppings are sign enough to look carefully and set up precautions against Coccidiosis. Chicks normal one morning may die in 12 to 24 hours.

Coccidiosis once in a brood spreads rapidly. Use prevention by keeping all possible sources of contamination out of the brooder house, avoid damp spots around water founts, use ample ventilation to remove condensation created by chicks, and stir litter often.

The usual treatment of Coccidosis is addition of an intestinal medicant to the feed. Four commonly used treatments are:

(1) Mix 80 pounds of regular mash and 20 pounds of dried buttermilk or dried skim milk.

(2) Add sulfaguanidine to the regular mash at the rate of one-half pound of the pure drug to 100 pounds of mash.

(3) Add sulfaquinoxaline to the regular mash at the rate of 3 tablespoonfuls of the pure drug per 100 pounds of mash.

(4) Add 10 pounds of sulphur to 190 pounds of the regular mash.

One of these medicated feeds is fed for two days, and then the regular feed for one day, followed by another two days using the medicated feed. Then feed the regular feed again for a day. If the chicks still appear in need of treatment after the sixth day, the medicated feed can be fed another day or two. The sulfa treatments are the more desirable to use.

CANNIBALISM

Cannibalism is not a disease but a vice or bad habit. Included under this head are all the kinds of picking: toe, feather, vent, tail, wing, and head. The habit is acquired at any time from two or three weeks to market age. Crowding, insufficient feeder space, too high temperature, poor ventilation and sun spots on the floor are looked upon as the most common causes. Correct the cause and cover the picked portion of attacked chicks with pine tar or red anti-pick salve. There may be few noticeable leaders in the vice; if so clip off to the quick the top of the upper mandible of the beak. Watch for an attempted recurrence and isolate the offenders. There are electric debeakers for those who want to use them. This machine burns off one quarter to one half inch of the upper mandible.